

CLAIMS

1. A transmitting apparatus, comprising:

a first transmitting unit operable to transmit a first signal component of a quadrature modulated signal as a signal in which data desired to be transmitted is modulated; and

a second transmitting unit operable to transmit a second signal component of said quadrature modulated signal as a training signal, said second signal component being orthogonal to said first signal component.

2. A transmitting apparatus as claimed in claim 1, wherein said first signal component is an in-phase signal component, and said second signal component is a quadrature signal component.

3. A transmitting apparatus as claimed in claim 1, wherein said first signal component is a quadrature signal component, and said second signal component is an in-phase signal component.

4. A transmitting apparatus as claimed in claim 1, wherein said training signal is formed by a known data sequence generated on the basis of a predetermined clock.

5. A transmitting apparatus as claimed in claim 1, further comprising:

a training signal generating unit operable to generate said training signal;

a transmission data generating unit operable to generate said data desired to be transmitted; and

a quadrature modulation unit operable to subject a data signal based on said data desired to be transmitted and said training signal to quadrature modulation to form said quadrature modulated signal.

6. A signal transmitting method, comprising:

transmitting a first signal component of a quadrature modulated signal as a signal in which data desired to be transmitted is modulated; and

transmitting a second signal component of the quadrature modulated signal orthogonal to the first signal component as a training signal.

7. A receiving apparatus, comprising:

a receiving unit operable to receive a signal including first and second signal components of a quadrature modulated signal, said first signal component including a signal in which data desired to be transmitted is modulated, and said second signal component being orthogonal to said first signal component and being transmitted as a training signal; and

an equalizer operative to adaptively equalize said first signal component using said training signal.

8. A receiving apparatus as claimed in claim 7, wherein said first signal component is an in-phase signal component, and said second signal component is a quadrature signal component.

9. A receiving apparatus as claimed in claim 7, wherein said first signal component is a quadrature signal

component, and said second signal component is an in-phase signal component.

10. A receiving apparatus as claimed in claim 7, wherein said training signal is formed by a known data sequence.

11. A receiving apparatus, comprising:

a receiving unit operable to receive a transmission signal including first and second signal components of a quadrature modulated signal, said first signal component including a signal in which data desired to be transmitted is modulated, and said second signal component being orthogonal to said first signal component and being transmitted as a training signal;

a signal separator operable to separate said transmission signal into a third signal component corresponding to said first signal component and a fourth signal component orthogonal to said third signal component and corresponding to said second signal component;

an equalizer operable to equalize said third signal component;

a signal generator operable to generate a known signal identical to said training signal; and

a correlation unit operable to use said third signal component, said fourth signal component and said known signal to obtain a ratio between a level of said second signal component included in said third signal component and a level of said second signal component formed by a direct wave

included in said fourth signal component, a ratio between a level of said second signal component formed by an indirect wave included in said fourth signal component and said level of said second signal component formed by said direct wave included in said fourth signal component, a time difference between said second signal component included in said third signal component and said known signal, and a time difference between said second signal component formed by said direct wave included in said fourth signal component and said second signal component formed by said indirect wave included in said fourth signal component;

whereby equalizing characteristics of said equalizer are adjusted on the basis of results obtained by said correlation unit.

12. A signal receiving method, comprising

receiving a signal including first and second signal components of a quadrature modulated signal, the first signal component including a signal in which data desired to be transmitted is modulated, and the second signal component being orthogonal to the first signal component and being transmitted as a training signal; and

adaptively equalizing the first signal component using the training signal.

13. A transmitting and receiving apparatus for transmitting and receiving a signal modulated by quadrature modulation, said transmitting and receiving apparatus comprising:

a transmitting unit operable to transmit a transmission signal including a first signal component of a quadrature modulated signal as a signal in which data desired to be transmitted is modulated, and a second signal component of said quadrature modulated signal as a training signal, said second signal component being orthogonal to said first signal component; and

a receiving unit operable to receive said transmission signal and to adaptively equalize said first signal component using said training signal.

14. A transmitting and receiving apparatus as claimed in claim 13, wherein said first signal component is an in-phase signal component, and said second signal component is a quadrature signal component.

15. A transmitting and receiving apparatus as claimed in claim 13, wherein said first signal component is a quadrature signal component, and said second signal component is an in-phase signal component.

16. A transmitting and receiving apparatus as claimed in claim 13, wherein said training signal is formed by a known data sequence.

17. A transmitting and receiving apparatus as claimed in claim 13, wherein said transmitting unit includes:

a training signal generating unit operable to generate said training signal;

a transmission data generating unit operable to generate said data desired to be transmitted;

a quadrature modulation unit operable to subject a data signal based on said data desired to be transmitted and said training signal to quadrature modulation to form said quadrature modulated signal; and

a transmitter operable to transmit said quadrature modulated signal.

18. A transmitting and receiving apparatus as claimed in claim 17, wherein said receiving unit includes:

a signal separator operable to separate said transmission signal into a third signal component corresponding to said first signal component and a fourth signal component orthogonal to said third signal component and corresponding to said second signal component;

an equalizer operable to equalize said third signal component;

a signal generator operable to generate a known signal identical to said training signal; and

a correlation unit operable to use said third signal component, said fourth signal component and said known signal to obtain a ratio between a level of said second signal component included in said third signal component and a level of said second signal component formed by a direct wave included in said fourth signal component, a ratio between a level of said second signal component formed by an indirect wave included in said fourth signal component and said level of said second signal component formed by said direct wave included in said fourth signal component, a time difference

between said second signal component included in said third signal component and said known signal, and a time difference between said second signal component formed by said direct wave included in said fourth signal component and said second signal component formed by said indirect wave included in said fourth signal component;

whereby equalizing characteristics of said equalizer are adjusted on the basis of results obtained by said correlation unit.

19. A method for transmitting and receiving a signal modulated by quadrature modulation, said method comprising:

transmitting a transmission signal including a first signal component of a quadrature modulated signal as a signal in which data desired to be transmitted is modulated and a second signal component of the quadrature modulated signal orthogonal to the first signal component as a training signal; and

receiving the transmission signal and adaptively equalizing the first signal component using the training signal.